



## FAO Consultation on Grain Legume Processing

A four-day consultation on grain legume processing was organized by the Food & Agriculture Organization (FAO) at the Central Food Technological Research Institute (CFTRI), Mysore, from 14 to 17 November 1977. Forty experts from Bangladesh, Ghana, Nepal, Nigeria, Philippines, Sudan, Tanzania, Thailand, UK, Guatemala, Mexico, Senegal, Canada, USA, Norway and India participated in the consultation.

Welcoming the experts, Dr B. L. Amla, Director, CFTRI, stressed the importance of grain legume conservation and processing using appropriate post-harvest technologies which can be successfully transferred to build economically viable industries in grain legume producing countries.

In his introductory talk, Dr H. A. B. Parpia of FAO, Rome, said that the objective of the consultation was not only to recognize the importance of production and conservation of grain legumes or pulses; but to discuss in detail their processing technologies with a view to making them available to the producing countries in an economically feasible form, and to provide them necessary assistance in establishing the industries for this purpose. This would help in the achievement of an important objective of the new international economic order as it will help in transmission of the predominantly agricultural economies into mixed agro-industrial economies.

A substantial portion of the grain legumes is consumed, especially in Asia

and Africa, after milling or dehusking or splitting or after some form of processing. Most of the commercial technologies available for this purpose are either obsolete or inadequate because they result in heavy losses due to breakage and powdering of the grain. Successful efforts have been made to develop improved technologies to reduce milling losses and improve product quality. Similarly, there is need for development and utilization of improved technologies for manufacture of products based on grain legumes.

Improved conservation and processing to reduce post-harvest losses and to manufacture economically priced products based on grain legumes would help increase the supplies. The development of this industry would provide additional rural employment, improve nutrition standards, ensure a better price to the grower and ensure supplies at lower prices to the consumer.

Dr Parpia said that one of the most effective means of overcoming malnutrition and under-nutrition in developing countries was to utilize their available food of vegetable origin more effectively. In this, grain legumes, which are the second largest source of protein, next to cereals, have a vital role. He said that grain legumes also provide certain essential amino acids which are necessary to balance the cereal diets. These diets are of special importance in developing countries where nearly 70% of the human population lives.

The discussions held at the consultation resulted in the following recommendations.

Training courses in conservation and processing of legumes should be organi-

zed in developing countries. Since CFTRI had the facilities of an international training centre with nearly 13 years of experience in training technical personnel, it was suggested that a beginning could be made at the institute to provide training in legume technology to be followed by organization of training courses in other developing countries.

Appropriate literature on conservation and processing of grain legumes, specifically for developing countries, should be brought out. The need for exchange of technological information of general and specific interest for the development of legume industries, especially between developing countries, on current problems was also emphasized.

A suitable mechanism for transfer of appropriate technology in the area of grain legumes should be established.

An international regional task force of those interested in drawing up joint research and development programmes of socio-economic importance should be constituted.

The area under cultivation of grain legumes should be increased, wherever possible, particularly in Africa and Latin America. In regions where the surplus land is scarce, as in India, production of grain legumes could be increased by adopting mixed or relay cropping systems. It was emphasized that production increase in farmers' fields is the key factor in contributing to increased country output which could be achieved not only by improvement in research, but also by looking into the actual needs of the farmer, such as timely economic help, assurance of technological inputs and

appropriate facilities for storage and marketing. Economic price support incentives should be given to the farmers by appropriate government agencies.

Every effort has to be made to apply the available technology and develop new technologies for the prevention of damage or loss in grain legumes in rural and urban centres. Service centres with a commercial approach would be needed in different countries.

Farmers should be encouraged to adopt the improved methods of storage of grain legumes which do not conflict with their way of life and are within their economic ambit and technical ability.

Screening of varieties of legume seeds should be taken up to identify insect-resistant varieties, as a long-term research and development programme. In the meantime, application of the existing appropriate technology and development of new ones should be implemented on a national scale.

The importance of interaction between the processor and breeder for the benefit of the consumer was stressed. Varieties possessing improved cooking and milling characteristics should be identified and propagated. Products and snack foods based on legumes should be encouraged and small-scale industries to produce these should be set up. Attempts should also be made to produce quick-cooking *dals* as this would conserve fuel and time.

### Training Course on Control of Contaminants in Foods

A six-month international Training course on control of environmental contaminants in foods has commenced at the Central Food Technological Research Institute (CFTRI), Mysore, on 21 November 1977. The course has been sponsored for the first time in India by the Food & Agriculture Organization and United Nations Environmental Programme and is being attended by 14 participants from Bangladesh, Cuba, Egypt, Fiji, Ghana, India, Jamaica, Mexico, Nepal, Phi-

lippines, Syria, Thailand and Zambia. The course is designed to train analytical and quality control personnel in monitoring and control of environmental contaminants in foods in developing countries. Such a training is expected to provide adequate knowledge to the participants to plan and implement monitoring and control programmes in their respective countries with a view to increasing food safety and overcoming non-tariff barriers to trade due to the presence of environmental contaminants.

The main thrust of the course will be on three major groups of chemical contaminants, viz. heavy metals, especially lead, cadmium and mercury; pesticide residues, especially of organochlorine type; and mycotoxins, especially aflatoxins.

After four months' training in modern and advanced analytical techniques, the trainees will go on a field trip for a period of five weeks, including visits to food control laboratories in order to have an idea of monitoring of contaminants being practised in India. This will be followed by a workshop in Bombay to discuss problems and designs for setting up monitoring and controlling laboratories in the participating countries.

### Students' Science Seminar : BITM

The Birla Industrial & Technological Museum (BITM), Calcutta, in collaboration with the Department of Youth Services of the Government of West Bengal; the Assam Science Society, Gauhati; and the Departments of Education of the Governments of Assam, Bihar and Orissa, organized students' seminars on important discoveries in genetics and potentialities and hazards of genetic engineering at different places in Assam, Bihar, Orissa and West Bengal during August-October 1977. In West Bengal there were block, district and state level seminars, while in the other three states, district and state level seminars

were held. The top winners from the district science seminars participated in the state level science seminars. The final contest was held among the top winners of Assam, Bihar, Orissa and West Bengal. The winner's challenge trophy was jointly shared by the students of Assam and West Bengal.

### NSC's Mobile Science Exhibition Unit Inaugurated

The Nehru Science Centre (NSC), Bombay, the third in the chain of science museums in India under CSIR, has thrown open to the public its first exhibition hall on the theme 'Light and Sight' and the first mobile science exhibition unit 'Man Must Measure' on 14 October 1977. Shri Sadiq Ali, Governor of Maharashtra, inaugurated these.

The exhibition on 'Light and Sight' contains more than 208 exhibits, most of which are of participatory type in which a visitor can push a button or move a crank and see the results. The major sections of the exhibition are : (i) Eye, a gateway to perception—it explains the function of eyes of men, animals and insects and discusses the defects of vision and their remedies; (ii) The science of reflection and refraction; (iii) An insight into the micro-world—where, with the use of lenses and mirrors, the normal vision is enhanced to see things too small or too far away for the human eye to see; (iv) The world of colours; (v) Fun with light—in which photocells and polaroid sheets have been extensively used; (vi) Light and motion—a section in which the beginning of cinematography has been explained; (vii) Captive light—to show that with the help of photography events of the past could be arrested and permanently recorded; (viii) A section on social history of lighting; (ix) Family of light—giving a description of the entire electromagnetic spectrum; and (x) An auditorium—where multi-media projection could be utilized.

The 24 exhibits of the mobile science exhibition unit 'Man Must Measure'

Trace the origin and the meaning of various measuring devices used by man in his daily life, and in commerce and industry, to measure length, time, mass, volume, electrical resistance, flow of liquids, rainfall, etc. The exhibition, which is designed to suit the requirements of common man and school children, will tour both the urban and rural areas.

### CSIR Polytechnology Clinic at Bombay

The establishment of a CSIR Polytechnology Clinic at Bombay for a period of two years in the first instance has been approved by CSIR. The major responsibility of the clinic would be to ensure solution of the problems referred to it. It would be responsible to parties for getting the job done through the concerned CSIR laboratories. The activities of the clinic will be guided by an advisory committee consisting of the nominees of CSIR, state government, and industry. The committee will be appointed by CSIR in consultation with others.

At the end of the trial period of two years, the performance of the clinic will be reviewed and a decision will be taken about its future.

### RRL, Jorhat, Develops Know-how for Phosphamidon

The Regional Research Laboratory (RRL), Jorhat, has developed the know-how for the production of phosphamidon, an important member of the enolphosphates group of organophosphorus pesticides which occupy a unique position owing to their high systemic action combined with easy degradability and reduced residual effects as compared to chlorinated hydrocarbons. The demand for phosphamidon is estimated at 650 tonnes/annum by 1978-79.

The know-how package on phosphamidon, based on extensive pilot plant investigations, is the first of its kind to be developed by RRL, Jorhat. It forms the first part of the technolo-

gy package which also includes the basic engineering component, and is expected to be ready soon. The developmental work on this project was taken up on a time-bound basis during the latter part of 1975 and the pilot plant investigations were completed as scheduled in February 1977. The scale of pilot plant operation is sufficient to allow a scale-up to a commercial production of 200 to 300 tonnes/annum of phosphamidon.

The notable achievements of the development team are the successful development of an on-line monitoring technique for precise control of reaction, better reactor practices for faster reaction rates, carefully designed solvent recycles for better intermediate utilization, built-in plant practices for pollution control, etc. In view of these, the technology is expected to have a distinct edge over the conventional process.

The process know-how (level II) of phosphamidon is ready for release on non-exclusive basis.

### Action of $\beta$ -Alanine on Central Nervous System

Dr R. N. Sur of the Department of Pharmacology in the Central Drug Research Institute, Lucknow, has carried out studies on the site and mechanism of action of  $\beta$ -alanine under the guidance of Dr B. Mukerji.

It was found that intrathecal injection of  $\beta$ -alanine inhibited the knee-jerk, flexor reflex, crossed extensor reflex and the flexor reflex facilitated by strychnine in the anaesthetized cat. The facilitation of the knee-jerk induced in the cat by electrical stimulation of contralateral sciatic nerve was depressed by intrathecal  $\beta$ -alanine. Similarly, the facilitation of the knee-jerk by electrical stimulation of the brain stem reticular formation and the linguomandibular reflex were inhibited by intraventricular administration of  $\beta$ -alanine. No significant difference between the potency of

## PATENTS FILED

53/Del/77 : Improvements in or relating to the process of manufacture of methaqualone and methaqualone hydrochloride, Y. R. Rao, M. Bapuji & S. N. Mahapatra—RRL, Bhubaneswar.

84/Del/77 : Improvements in or relating to a device for depositing homogeneous and pin hole free films of silicon monoxide material for the fabrication of thin film capacitors for hybrid integrated circuits, Awatar Singh—CEERI, Pilani.

162/Del/77 : A device for observing vacuum processes giving off condensible vapours, Awatar Singh—CEERI, Pilani.

169/Del/77 : Regenerative smokeless domestic oven, T. K. Bhattacharyya & A. K. Majumdar—CMERI, Durgapur.

170/Del/77 : Improvements in or relating to the process for production of isatoic anhydride from phthalimide, Y. R. Rao, M. Bapuji, K. M. Rao & S. N. Mahapatra—RRL, Bhubaneswar.

171/Del/77 : Improvements in or relating to the process for production of methyl and ethylanthranilates from isatoic anhydride, Y. R. Rao, M. Bapuji & S. N. Mahapatra—RRL, Bhubaneswar.

177/Del/77 : Improvements in or relating to attenuated total reflection (ATR) accessory to record ATR spectra on a spectrograph/spectrophotometer, Y. S. Jain (Pool Officer)—Aligarh Muslim University, Aligarh.

180/Del/77 : Process for protection of aluminium and aluminium alloy sheets against corrosion during storage and damage by scratches during manufacturing processes by coating with an anti-corrosive scratch-resistant and strippable surface coating (CSIR Scheme) — B. N. Ganguli & (Km) R.S. Nigam—Defence Research Laboratory (Materials), Kanpur.

192/Del/77 : Improved process for the manufacture of carbon fibres from polyacrylonitrile fibres, O. P. Bahl & L. M. Manocha—NPL, New Delhi.

(Contd on p. 188, col. 1)

(Contd from p. 187, col. 2)

$\beta$ -alanine and GABA was found on the flexor and linguomandibular reflexes. Topical application of  $\beta$ -alanine on the cerebral cortex produced reversal of polarity in the 'recruitment' waves. Intraventricular administration of  $\beta$ -alanine in the immobilized cat changed the EEG from arousal pattern to sleep pattern and depressed the rhinencephalic excitability.  $\beta$ -Alanine administered intravenously through the chronically implanted canula produced sleep in the cat. The results point to the conclusion that  $\beta$ -alanine has a non-specific depressant action on the different types of neurones of the central nervous system.

Dr Sur has been awarded the Ph.D. (Med.) degree of the Calcutta University for his thesis based on the studies.

### New Rich Source of Methyleugenol

The Regional Research Laboratory, Jorhat, has explored a species of *Cymbopogon*, viz. *C. flexuosus*, which can serve as a good source of methyleugenol. Methyleugenol is required in the preparation of  $\alpha$ -methyl dopa, a highly potent drug for hypertension.

*C. flexuosus* grows well under the agro-climatic conditions of Jorhat and yields 0.5-1% oil with 81.8% methyleugenol in laboratory scale distillation. Oil extracted from the material in 250 kg capacity distillation still was analyzed at the Regional Research Laboratory, Jammu, and the recovery of methyleugenol was reported to be 53.5%.

### Report on Garo Hills

The Regional Research Laboratory, Jorhat, has prepared a report on Garo Hills regarding the instrumental role of the inputs of science and technology for the socio-economic development of the district. Garo Hills district in Meghalaya has been adopted by the Government of India in the first phase of its integrated rural development programme out of 20 districts identified all over India. The responsibility of coordinating the activities of Garo Hills district has been assigned to RRL, Jorhat.

The report outlines the profile of the people—their habits and traditions; root causes of backwardness; and the barriers to growth and new opportunities. An approach for possible development of Garo Hills through the application of science and technology within the bounds of its social and cultural setting has also been suggested. The report also includes the statistics and characteristics of mineral resources of the district vis-a-vis Meghalaya and identified CSIR technologies which could find roots in the district.

### Deputation Briefs

Dr A. P. Mitra of the National Physical Laboratory, New Delhi, attended, as one of the members of Indian delegation, the third general scientific assembly of the International Association of Geomagnetism and Aeronomy (IAGA) and the second special assembly of the International Association of Meteorology and Atmospheric Physics (IAMAP), held in Seattle, USA, from 22 August to 3 September 1977. Dr Mitra attended the following sessions: (i) Electric currents and atmospheric motions in the lower thermosphere; (ii) Minor neutral constituents in the middle atmosphere—chemistry and transport; (iii) Influence of solar activity and geomagnetic changes on weather and climate; (iv) Ions in the middle atmosphere—chemical, physical and electrical aspects; (v) Recent advances in neutral and ionospheric models in the thermosphere; (vi) Laboratory studies related to aeronomy and other topics; (vii) Homogeneous and heterogeneous reactions in the troposphere; and (viii) Carbon dioxide cycle.

In addition, there were special sessions on (i) Planning of the international middle atmospheric project (MAP), and (ii) Need for ionosondes in 1980s.

Presented below are the proceedings of the various symposia and sessions as reported by Dr Mitra.

### The Ozone Depletion Problem

In the light of the new results presented, it was apparent that Cl plays a

more important role than NO in ozone depletion and that the threat from the nitrogenous fertilizers is not as serious as previously supposed. A result of considerable interest was the observation on variation in the soft ultraviolet radiation (5% around 2000 Å and 1% in 3000 Å). This means that ozone variation as a function of solar activity can arise directly from the variation in solar flux.

### Solar Activity and Weather

New experimental results supporting a relationship between solar activity and weather were presented. It was pointed out that weather might change with solar activity as a result of (i) variation in solar constant; or (ii) change in ozone with solar activity; or (iii) direct change in earth's albedo with solar activity due to aerosol activity.

The changes can be of three types: (i) long-term ( $10^4$ - $10^5$  years, due to astronomical factors) variations; (ii) short period ( $10^0$ - $10^1$  years due to ozone mechanisms) variations; and (iii) still shorter-term variations.

It was further pointed out that an important mechanism exists, changing ozone with solar activity through changes in NO in the following chain: solar particles  $\rightarrow$  NO<sub>x</sub> changes  $\rightarrow$  O<sub>3</sub> changes  $\rightarrow$  T changes.

In evidence, it was pointed out that the very large solar flare of August 1972 produced a change of 10% in ozone as observed by the Nimbus-4 satellite.

Mustel from USSR provided evidences of pressure changes following geomagnetic storms, and Mitchell from USSR showed that draught severity contours in USA had a dominant 22-year period (double solar cycle), the maximum draught area being in the early part of the cycle.

The general conclusion was of a solar cycle control on climate and of the presence of at least two mechanisms, one of short-term nature and another of a long-term nature, the short-term ones being connected with solar particle injection.

## Ion in the Middle Atmosphere

An international programme on the Middle Atmosphere (MAP) is being organized under a special committee on Solar Terrestrial Physics. The programme is expected to throw light on: (i) possibilities of damage to the earth's middle atmosphere as a result of human activities; (ii) role of the middle atmosphere in determining climate and climatic changes; and (iii) the processes for which the Sun acting through the middle atmosphere may be able to affect.

The programme will begin from 1978 and its target would be the region from 15 to 25 km, thus covering both the stratosphere and the mesosphere. India will play an important part in this programme.

In the symposia sessions related to the MAP programme, new results were presented showing that NO in equatorial and mid-latitudes essentially remains unchanged but in polar latitudes changes widely from time to time, and that during disturbances such as solar cosmic events and during winter anomaly, NO is increased by about a factor of 10.

The consequence is a large increase in electron density resulting in increased absorption in high, medium and low frequencies. There was also evidence to show that these large increases in NO were a result of dynamic forces with changes in the wind system during winter anomaly conditions.

An important conclusion was that the role of aerosols so long considered to be important only in the troposphere now appears to extend right up to 100 km.

The IAGA now includes a very large amount of atmospheric physics and chemistry and it is desirable that in India the IUGG committee (of which IAGA is a part) is restructured to reflect this increasingly larger interest on aeronomy. The primary concern in IAGA (and also by IAMAP) is now concentrated on the role that minor constituents play in the formation and modification of our environment.

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Shri K. Seshagiri Rao of the Regional Research Laboratory, Hyderabad, visited some of the leading research institutes on coal processing in the Federal Republic of Germany, during September-October 1977, under the CSIR-German Academic Exchange of Scientists Programme, for a study-cum-information trip.

At the Institut für Chemische Technologie und Brennstoff Technik Technische Universität Clausthal-Zellerfeld, Shri Rao studied the following problems: (i) production of formed coke by the two-stage process; (ii) pressure drop and gas distribution studies in blast furnace to arrive at an optimum size of formed coke to be used; (iii) separation of pyrites from fine coal; (iv) classification and collection of particles in 10-150  $\mu\text{m}$  range by mechanical separation; (v) production of coke from brown coal for use in electrometallurgy; and (vi) environmental pollution by oxides of nitrogen and sulphur from exhaust gases of automobiles.

At the Bergbauforschung GmbH (Steinkohlenbergbauverein) Essen-Kray, the problems studied were concerned with coal processing, especially: (i) formed coke (metallurgical and domestic) production using a medium temperature carbonization coke, and a coking coal applying the technique of hot briquetting; (ii) conventional briquetting using sulphite lye as binder and after-treatment to get coke for domestic use; (iii) gasification of coal in the laboratory on 1 kg carbon per hour and 200 kg/hr on an experimental scale in a fluidized bed using superheated steam as fluidizing gasifying medium and helium at 95°C as a heat transfer medium (Helium from nuclear reactor is proposed to be used in large scale plant); (iv) laboratory studies on conversion of coal to oil; (v) kinetics of carbonization and gasification; and (vi) laboratory investigation on fluidized bed combustion.

Shri Rao also visited three research institutes of the Rheinische Westfälische Technische Hochschule, Aachen. At the Institut für Brennstoff Chemie und

Phys. Chem. Vervahrenstechnik, the following problems were studied: synthesis of methane in a fluidized bed under heterogeneous catalysis and synthesis under pressure; synthesis of ethylene under the group of unconventional Fischer-Tropsch synthesis; problems of kinetics of the reaction of brown coal coke with  $\text{CO}_2$  and steam, with increasing carbon burn-off; and effect of additives before carbonization.

At the institute for ferrous metallurgy, Shri Rao studied laboratory investigation on gasification of coal at 60 atmospheres and 1000°C, simulating conditions of underground gasification using the pulsation technique of sending gasifying medium. He also studied the gasification of brown coal as mined in a tubular furnace and the problems on economic coupling of reducing gas to blast furnace to save on coke requirement. Development of activated carbon from brown coal coke for the coke oven effluent treatment was also studied.

At the institute for coke oven and briquetting technology, Shri Rao visited the experimental facilities available for briquetting and studied the experiments on briquetting and carbonization of brown coal. He also visited the following industrial units: (i) coal preparation plant (1,50,000 tonnes/week) at Lohberg; (ii) 'Ancit' formed coke plant (15 tonnes/hr) (at Alsdorf) of Eschweiler Bergwerks Verein using the technique of hot briquetting and producing domestic coke; and (iii) 'Extracit' formed coke plant (50 tonnes/hr) of Sofia Jakobi mines at Huckelhoven using sulphite lye as binder and carrying out after-treatment of the briquettes to get smokeless domestic fuel.

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Dr E. R. R. Iyengar of the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, visited USA, on deputation, as a nominee of the Department of Science and Technology, Government of India, from 14 to 30 September 1977 to attend the international workshop on bio-saline research held at Kiawah.

The deputation was sponsored by the US National Science Foundation (NSF) and the Indiana University.

The main theme of the workshop (15-18 Sep.) was to discuss the state of art in the different fields of bio-saline research with a broad goal to provide options to human material needs (food, energy, chemicals, feeds, etc.) from renewable resources. There were five scientific sessions in which position papers were presented by Dr James Bassham, Dr D. W. Rains and Prof. W. J. Oswald of the University of California, Prof. A. Mitzui of the University of Miami, and Dr R. W. Coughlin of the University of Connecticut.

Dr Iyengar also visited the different laboratories of (i) Arizona University; (ii) US Salinity Laboratory, Riverside; (iii) California University, Davis Campus; and (iv) California University, Berkeley Campus.

In the final discussions held at NSF (19-26 Sep.) in Washington, Dr Iyengar explained the research capabilities available at CSMCRI for the use of sea-water for growing plants and the seaweed biology and technology research being carried out at CSMCRI.

From the experience gathered from this visit Dr Iyengar suggests that India can take the advantage of introducing plants like Jojoba, the seeds of which produce an oil which can replace sperm whale oil, and *Pinus* sp. (used as firewood) which can be grown under desert conditions on the coastal rural belt. India can also collaborate with California University, Davis Campus, on the use of sea-water for growing plants and crops. It would also be worthwhile (i) to introduce certain useful marine algae into Indian waters, and (ii) to cultivate *Dunaliella* sp. for production of glycerol.

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Shri W. E. Eipeson and Shri K. Lakshminarayana Rao of the Central Food Technological Research Institute (CFTRI), Mysore, visited the Federal Republic of Germany, on deputation, from 1 August to 31 October 1977.

Their visit was sponsored by the joint CSIR-KFA (Kernforschungs Anlage, Julich, West Germany) exchange programme. The main objective of their visit was to study the technological and engineering aspects of fruit aroma recovery. A pilot plant for this purpose is being gifted to India (CFTRI) by KFA.

Shri Eipeson studied the technological aspects of aroma recovery, reconstitution and related aspects and Shri Rao studied the operational and design aspects of aroma recovery plants.

## PROGRESS REPORTS

### NIO Annual Report: 1976

The National Institute of Oceanography (NIO), Goa, has brought out its annual report for 1976. The report shows that the institute carried out a substantial amount of sponsored research during the year with a total earning of Rs 37.5 lakh which amounted to about 25% of the expenditure. The sponsored projects relating to various types of surveys in the sea opened new avenues for the utilization of technology available at the institute. Some of the important sponsored projects were: (i) survey of pipeline route from Bombay High to Bombay for the Oil & Natural Gas Commission; (ii) hydrographic survey and water quality studies in and around Bombay for the Bombay Municipal Corporation; and (iii) hydrographic features off Karwar and Mangalore for Ballarpur Industries and Mangalore Fertilizers Ltd respectively, to determine suitable points for the discharge of effluents.

The institute acquired its first research vessel *Gaveshani* and commissioned it for oceanographic research. In all, 13 cruises were undertaken in the Arabian Sea and the Bay of Bengal, and as a result, considerable information was gathered on the seas around India.

R&D activities under 18 institutional projects were intensified during the year to develop the essential know-how to be used by the industries and public sector undertakings.

A breakthrough was achieved in the rope culture of green mussels in Goa where the growth rate was accelerated by 60%. The annual production achieved was as high as 60 kg/m<sup>2</sup> as against 1 kg/m<sup>2</sup> under natural conditions.

New grounds of prawns were located along the east coast of India. An improved solar still was developed for desalination of sea-water, which gave a high yield of freshwater with a low initial cost.

An important project in physical oceanography was the oceanographic survey of the shelf and adjoining areas off the Indian coast on board *R V. Gaveshani* for studying the physical processes. Work was started on coastal and ocean engineering and building up of capabilities in this field to achieve short- and long-term objectives of the institute in this important area. The projects were concerned with: (i) ocean-atmosphere interaction with special reference to seas around India; (ii) physical processes occurring in the seas around India; and (iii) land-sea interaction and nearshore circulation with application to coastal zone management.

The main projects in chemical oceanography were: (i) chemical studies in the coastal and offshore waters in the Arabian Sea and the Bay of Bengal; and (ii) desalination of sea-water.

In geological oceanography, projects pursued were: (i) geological and geophysical surveys to assess the petroleum and mineral prospects of the western continental margin of India; (ii) geochemistry of the sediments of the western continental margin of India; (iii) sediments of the western continental margin of India; and (iv) foraminifera as indicators of high organic carbon and pollution in the marine environment.

Major projects in biological oceanography were: (i) studies on primary, secondary and tertiary levels of the food chains; (ii) coastal aquaculture; (iii) biogeography of the zooplankton of the Indian Ocean; and (iv) ecologi-

ce, developmental and experimental studies on plankton.

The activities of the two regional centres at Cochin and Bombay were reorganized and a new regional centre was established in Waltair to cater to the needs of the east coast of India (Bay of Bengal). A new Ocean Engineering Division was also started in the institute during the year.

The construction of a tower to accommodate a storm/cyclone warning radar was also started. This marks the

beginning of the future collaboration between NIO and India Meteorology Department which will provide radar and manpower at their own cost.

The institute also completed the first phase of the project titled 'Marine environmental monitoring and marine living resources assessment programmes for the Indian Ocean region' sponsored by the United Nations Environment Programme.

Sixty-four papers were published during the year.

## PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

### DC Motor Controller

A dc motor controller using thyristors has been developed at the National Aeronautical Laboratory, Bangalore, for motors of up to 10 hp capacity. The unit is reversible in its applications and can be used for all types of dc motors—series, shunt, compound, etc. The modular design helps in having easy manufacturing procedures and upscaling of the controller for high power motors.

The pulse tachogenerator and the feedback control technique greatly improves the accuracy of operation (to 0.5%) against the load variation and power supply fluctuations. The controller incorporates the regenerative braking facility for instant stop of the motor. The compensation circuit limits the overshoot to 30%. Continuous maximum torque can be obtained up to the lower speed limit.

Motor controllers built in the laboratory are in use at the laboratory and at International Instruments Pvt. Ltd. and the performance has been found satisfactory.

Some special features of the controller are : (i) dual three-phase thyristor bridge controller with dc output of 500 V and 30 A; (ii) trigger network design using 74 series TTL logic circuits; (iii) pulse driver network for thyristor triggering; (iv) current sensing and limiting network for automatic

starting; (v) magnetic pulse tachogenerator for speed monitoring and feedback control; (vi) feedback circuit design for 0.5% speed control accuracy; (vii) special control circuits for regenerative braking and reversing; (viii) four regulated power supplies; (ix) separate dc power supply for field; (x) HRC fuse protection link for thyristor and motor; (xi) meters for speed and torque monitoring; and (xii) three-phase mains contactor design for motor protection.

The specifications of the drive developed at NAL are :

Power supply	: 400 V, 3 phase, 50 Hz, 10 kW
Built in dc power supply	: +12 V 500 mA, 0.2% regulation; +12 V 2 A, 0.1%; -12 V 500 mA, 0.1%; +5 V 1 A, 0.1%; and + 500 V rectifier supply for the field
Dual thyristor bridge	: 12 thyristors to supply 500 V 30 A dc on either direction
Speed sensor	Magnetic pulse tachogenerator to sense speed up to 5000 rpm
Current sensor	: ac current transformer and instrumentation for currents up to 30 A

The main components required are silicon-controlled rectifier, integrated circuits (74 series digital integrated circuits, operational amplifiers 741,

linear circuit comparator 710, power supply regulator 3085 A), transistors, diodes and rectifiers, power supply transformer, pulse transformer, inductor choke coil, current transformer, electrolytic capacitor, tantalum capacitor, polycarbonate capacitor, moving coil meter, heat sinks, toggle switch, HRC fuse link and cartridge fuse. All the components except 74 series of digital integrated circuits are available indigenously. The value of import content is \$ 30 per unit.

The main test instruments required are oscilloscope, microvoltmeter, frequency counter, current meter and voltmeter. All these are available indigenously.

The know-how is economical if worked as an adjunct to an established electronic industry with some additional facilities.

The suggested capacity of an economically viable unit is 30 units per annum. The fixed capital required for equipment is Rs 30,000 and the working capital, Rs 83,000. The estimated cost of production per unit is Rs 11,000.

According to the Electronics Commission report, the requirements for the 10 kW drive during 1974-79 is 5000 units in the public sector undertakings. Most of the industries licensed for manufacturing these drives have taken up foreign know-how. The device finds wide application in machine tool industry, precision mechanical drive applications and electrochemical industries.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

## PERSONNEL NEWS

### Appointments/Promotions

Shri V. L. Mashelkar has been appointed Scientist C1 at the National Chemical Laboratory, Poona (27 Oct. 1977).

#### Retirements

Shri R. V. Kulkarni, Scientist EII, National Chemical Laboratory, Poona, retired (30 Sep. 1977).

### Coal Science and Technologies for the Eighties

The Central Fuel Research Institute (CFRI), Dhanbad, has proposed to organize a 3-day international symposium on the above theme with the broad objective of assessing the present status of science and technologies pertaining to coal and projecting the need for development of the requisite technologies for application in the next decade. The symposium, to be held at CFRI in the winter of 1978-79, will cover the following : (1) status review and projection of coal science; (2) critical assessment of current coal utilization technologies; and (3) planning of research for development of new technologies including those for meeting the needs of possible end uses of coal which will have socio-economic impact on coal producing countries, with particular reference to India.

Intending authors should send synopses of the papers (in duplicate and not exceeding 500 words) to the Organizing Secretary by 1 February 1978. The screening committee will advise the authors on the acceptability of the paper(s) before the end of February 1978. Full papers are required to be submitted by the author(s) on or before 30 June 1978.

All communications concerning the symposium should be addressed to the Organizing Secretary, Symposium on Coal Science and Technology for the Eighties, Central Fuel Research Institute, P. O. FRI-828108, Dhanbad.

### International Solar Energy Congress

'Sun : Mankind's future source of energy' has been chosen as the theme for the International Solar Energy Congress which will be held from 16 to 21 January 1978 in Vigyan Bhavan,

New Delhi. The congress, which will be attended by about 1000 delegates representing about 60 countries, will discuss in its technical sessions, among others, the topics: (i) International and national plans and programmes: Economic aspects; policy, social and implementation aspects; (ii) Solar radiation; energy storage; photovoltaics; photochemistry, photobiology and biomass; (iii) Flat plate collector, including solar ponds and selective surfaces; concentrating systems; (iv) Space heating and cooling, including water and swimming pool heating; solar energy and architecture, solar thermal power systems; wind power; and (v) Agricultural and industrial applications including distillation. Two post-congress workshops and an exhibition of solar energy devices and products will also be held during that period.

The congress is being organized by the International Solar Energy Society, in collaboration with Solar Energy Society of India; Department of Science & Technology; Ministry of Energy; Council of Scientific & Industrial Research; Indian Council of Agricultural Research; Bharat Heavy Electricals Ltd; Tata Energy Research Institute; United Nations Educational, Scientific & Cultural Organisation; and Commonwealth Secretariat.

### Shanti Swarup Bhatnagar Prizes (1977) for Science and Technology

The Council of Scientific & Industrial Research (CSIR) awards each year five or more prizes, each of Rs 10,000, for outstanding research, applied or fundamental, in the following disciplines: (i) Physical sciences; (ii) Chemical sciences; (iii) Biological sciences; (iv) Engineering technology; (v) Medical sciences; (vi) Mathematical sciences; and (vii) Other sciences. The prizes are given in the memory of Dr Shanti Swarup Bhatnagar, the founder-director of the Council.

Nominations are invited for the Shanti Swarup Bhatnagar Prizes for Science and technology for the year 1977. Any citizen of India below the age of 45 years as on 31 December 1976 and who has made conspicuously important contributions to fundamental/applied sciences in the particular field of his endeavour by his work done in India during the past five years of the Prize is eligible for nomination.

Nominations can be made amongst others by vice chancellors of universities/deans of science, engineering including technology and medical faculties, directors of IIT's, deans of faculties and institutions deemed to be of university status and heads or director generals of major R&D organizations such as DRDO, ICAR, ICMR, Space Communication, BARC, TIFR and the directors of CSIR laboratories. University faculties and IITs should recommend persons working in their institutions only and route the nominations through their respective vice chancellors or directors. The directors of CSIR laboratories can nominate a candidate in the discipline of their interest, irrespective of whether they are working in CSIR laboratories or outside.

Each such nomination shall be accompanied by detailed statement of work and attainment of the nominee, and a critical assessment report (not more than 500 words) bringing out the importance of the significant research and development contributions of the nominee made in India during 5 years proceeding the year of prize. Ten copies of these (biodata) and one complete set of reprints may be sent.

The last date for receiving the nominations for the prize is 28 February 1978. Nominations should be sent in sealed cover, marked 'Confidential' to the Head, Extra-Mural Research, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001.







